



Grid Automation Controller COM600 4.0 SNTP OPC Server User's Manual

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1. About this manual

1.1. Copyrights

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1.2. Trademarks

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1.3. General

This manual provides thorough information on the SNTP OPC Server and the central concepts related to it. You find instructions on how to configure SNTP OPC Server related objects. The basic operation procedures are also discussed.

Information in this user's manual is intended for application engineers who configure the SNTP OPC Server.

This user's manual is divided into following sections:

Introduction

This section gives an overview of the SNTP OPC Server and its features.

Configuration

In this section you will find an overview of configuration. You are given instructions on how to configure SNTOPC Server related objects and the model of a substation or system.

Operation

This section covers the basic operation procedures you can carry out when transferring or activating Grid Automation Controller COM600 (later referred to as COM600) with new configurations.

1.4. Document conventions

The following conventions are used for the presentation of material:

- The words in names of screen elements (for example, the title in the title bar of a window, the label for a field of a dialog box) are initially capitalized.
- Capital letters are used for the name of a keyboard key if it is labeled on the keyboard. For example, press the ENTER key.
- Lowercase letters are used for the name of a keyboard key that is not labeled on the keyboard. For example, the space bar, comma key, and so on.
- Press CTRL+C indicates that you must hold down the CTRL key while pressing the C key (to copy a selected object in this case).
- Press ESC E C indicates that you press and release each key in sequence (to copy a selected object in this case).
- The names of push and toggle buttons are boldfaced. For example, click **OK**.
- The names of menus and menu items are boldfaced. For example, the **File** menu.
 - The following convention is used for menu operations: **MenuName > MenuItem > CascadedMenuItem**. For example: select **File > New > Type**.
 - The **Start** menu name always refers to the **Start** menu on the Windows taskbar.
- System prompts/messages and user responses/input are shown in the Courier font. For example, if you enter a value out of range, the following message is displayed:

Entered value is not valid. The value must be 0 - 30 .

- You can be asked to enter the string MIF349 in a field. The string is shown as follows in the procedure:

MIF349

- Variables are shown using lowercase letters:

sequence name

1.5. Use of symbols

This publication includes warning, caution, and information icons that point out safety-related conditions or other important information. It also includes tip icons to point out useful information to the reader. The corresponding icons should be interpreted as follows.



The electrical warning icon indicates the presence of a hazard which could result in electrical shock.



The warning icon indicates the presence of a hazard which could result in personal injury.



The caution icon indicates important information or warning related to the concept discussed in the text. It may indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.



The information icon alerts the reader to relevant facts and conditions.



The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

1.6. Terminology

Term	Description
Alarm	An abnormal state of a condition.
Alarms and Events; AE	An OPC service for providing information about alarms and events to OPC clients.
Data Access; DA	An OPC service for providing information about process data to OPC clients.
Data Object; DO	Part of a logical node object representing specific information, for example, status, or measurement. From an object-oriented point of view, a data object is an instance of a class data object. DOs are normally used as transaction objects; that is, they are data structures.

Term	Description
Data Set	The data set is the content basis for reporting and logging. The data set contains references to the data and data attribute values.
Device	A physical device that behaves as its own communication node in the network, for example, protection relay.
Event	Change of process data or an OPC internal value. Normally, an event consists of value, quality, and timestamp.
Intelligent Electronic Device	A physical IEC 61850 device that behaves as its own communication node in the IEC 61850 protocol.
Logical Device; LD	Representation of a group of functions. Each function is defined as a logical node. A physical device consists of one or several LDs.
Logical Node; LN	The smallest part of a function that exchanges data. An LN is an object defined by its data and methods.
LON	A communication protocol developed by Echelon.
LON Application Guideline for substation automation; LAG	A proprietary method of ABB on top of the standard LON protocol.
OPC	Series of standards specifications aiming at open connectivity in industrial automation and the enterprise systems that support industry.
OPC item	Representation of a connection to the data source within the OPC server. An OPC item is identified by a string <object path>:<property name>. Associated with each OPC item are Value, Quality, and Time Stamp.
Property	Named data item.
Report Control Block	The report control block controls the reporting processes for event data as they occur. The reporting process continues as long as the communication is available.
SPA	ABB proprietary communication protocol used in substation automation.
SPA device	Protection and/or Control Product supporting the SPA protocol version 2.5 or earlier.
Substation Configuration Language; SCL	XML-based description language for configurations of electrical substation IEDs. Defined in IEC 61850 standard.

1.7. Abbreviations

Abbreviation	Description
AE	Alarms and Events
ASDU	Application Service Data Unit

Abbreviation	Description
BRCB	Buffered Report Control Block
DA	Data Access
DMCD	Data Message Code Definition
DO	Data Object
GW	Gateway, component connecting two communication networks together
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Device
LAG	LON Application Guideline for substation automation
LAN	Local Area Network
LD	Logical Device
LMK	LonMark interoperable device communicating in LonWorks network. In this document, the term is used for devices that do not support the ABB LON/LAG communication.
LN	Logical Node
LSG	LON SPA Gateway
NCC	Network Control Center
NUC	Norwegian User Convention
NV	Network Variable
OLE	Object Linking and Embedding
OPC	OLE for Process Control
P&C	Protection & Control
PLC	Programmable Logic Controller
POU	Program Organization Unit
RTS	Request To Send
SA	Substation Automation
SCD	Substation Configuration Description
SCL	Substation Configuration Language
SFC	Sequential Function Chart
SLD	Single Line Diagram
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SOAP	Simple Object Access Protocol
RCB	Report Control Block

Abbreviation	Description
URCB	Unbuffered Report Control Block
XML	eXtended Markup Language

1.8. Related documents

Name of the manual	MRS number
COM600 User's manual	1MRS756125

1.9. Document revisions

Document version/date	Product revision	History
A/30.6.2011	3.5	Document created
B/31.5.2012	4.0	Document revised

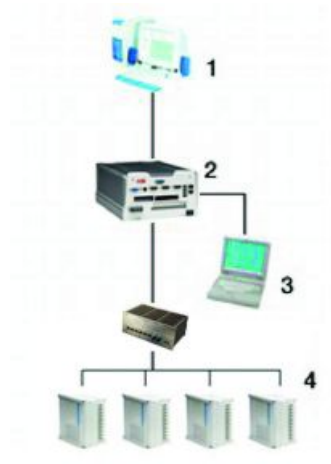
2. Introduction

2.1. Functional overview

The SNTP OPC Server includes an SNTP server and a client. The SNTP server enables SNTP clients (for example, IEDs) to synchronize their time with the time of COM600. The SNTP client of the SNTP OPC Server enables the synchronization of COM600 from an external SNTP server (for example, GPS Clock device). The SNTP server and client functionality can be configured and activated separately. The SNTP OPC Server provides diagnostic information about the synchronization status, that can be used, for example, in the COM600 HMI, or forwarded to a remote system via a slave protocol.



IEC 61850 OPC Server also includes the SNTP server and client functionality. The SNTP server and client should be configured either in the IEC 61850 OPC Server or in the SNTP OPC Server, but not in both.



SNTP_overview.png

Figure 2.1-1 System overview

1. Network time source
2. COM600 with SNTP OPC Server
3. Station Automation Builder 600 (SAB600)
4. Protection and control devices with SNTP client

2.2. SNTP OPC Server features

The SNTP OPC Server supports the following features:

- OPC Data Access Server v. 1.0/2.0

SNTP OPC Server User's Manual

- OPC Alarms and Events server v. 1.10
- SNTP client and server for time synchronization

3. Configuration

3.1. About this section

This section guides you in the configuration tasks required before you can start using the SNTP OPC Server. For information on the IEC 61850 data modeling, refer to COM600 User's Manual.

Start SAB600 to open a project. You can also open and name a new project.

1. Select **File > Open/Manage Project...**
2. In the Open/Manage Project dialog, select the required location for the project:
 - Projects on my computer
 - Projects on network
3. Select **New Project** on the left.
 - Enter a Project Name. The Description is optional.
4. Click **Create**.
5. Click **Open Project**.

3.2. Overview of configuration

Before you can start using the SNTP OPC Server, you need to build and configure an object tree in SAB600 to define the Communication structure within the Gateway object.

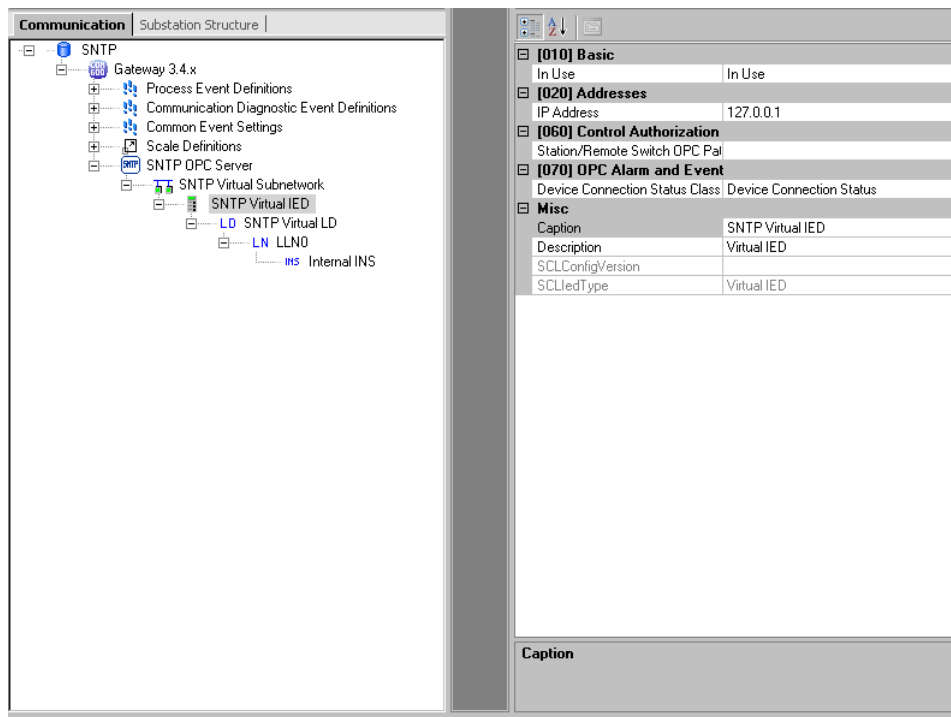
The possible objects are:

- Gateway
- SNTP OPC Server
- SNTP Virtual Subnetwork
- SNTP Virtual IED
- Logical Device objects
- Logical Node objects
- Data objects

Figure 3.2-1 shows an example view of SAB600 including an object tree in the communication structure on the left and Object Properties window displaying the object properties on the right.



When configuring OPC servers the following characters cannot be used in object names: \ ` ' ' #



SNTP_example2

Figure 3.2-1 Example view of SAB600

The configuration work can basically be divided into two separate tasks:

1. building an object tree, and
2. configuring object properties.

First, you need to build an object tree. This is done by adding objects to the object tree, see 3.4.1, General about building object tree.

Figure 3.2-1 shows an example of how the object tree may look like after it has been built. In the example tree you can see the SNTP OPC Server object and its child objects like subnetworks, devices, and data objects. Indentation is used to indicate the parent-child relationship between the objects.

After you have added the necessary objects to the object tree in the communication structure, you need to configure them, see 3.5.1, Configuring object properties.

Table 3.2-1 SNTP OPC Server related objects

Object	Description
SNTP OPC Server	An object representing the SNTP OPC Server.
SNTP Virtual Subnetwork	Object representing a physical subnetwork.
SNTP Virtual IED	The IED object presents a virtual device.
SNTP Virtual Logical Device (LD)	An object representing a group of functions. Each function is defined as a Logical Node. A device consists of one or several LDs.

Object	Description
Logical Node (LN)	An object defined by its data and methods. LN is the smallest part of a function that exchanges data.
Data Object (DO)	Data object is an instance of one of the IEC 61850 Data Object Classes such as Single point status and Measured Value. Depending on the class, each data object has a set of attributes for monitoring and controlling the object, e.g. value, quality, and control.

3.3. Configuring SNTP OPC Server properties

Table 3.3-1 lists the configurable SNTP OPC Server properties and value ranges for them. The actual configuration by using SAB600 is performed as described in 3.5.1, Configuring object properties.

Table 3.3-1 SNTP OPC Server properties

Name	Value/Value range	Description
SNTP Client		
1. Address for SNTP Server		IP address or node name for SNTP Server (Primary)
1. Port Number	(1..65535) Default: 123	TCP/IP port number
1. Synchronization Interval	(0..3600) Default: 15	Time synchronization interval in seconds. If value is 0, no time synchronization will be done.
2. Address for SNTP Server	Default: None	IP address or node name for SNTP Server.
2. Port Number	(1..65535) Default: 123	TCP/IP port number
2. Synchronization Interval	(0..3600) Default: 15	Time synchronization interval in seconds. If value is 0, no time synchronization will be done.
3. Address for SNTP Server		IP address or node name for SNTP Server.
3. Port Number	(1..65535) Default: 123	TCP/IP port number.
3. Synchronization Interval	(0..3600) Default: 15	Time synchronization interval in seconds. If value is 0, no time synchronization will be done.
4. Address for SNTP Server	Default: None	IP address or node name for SNTP Server.

Name	Value/Value range	Description
4. Port Number	(1...65535) Default: 123	TCP/IP port number.
4. Synchronization Interval	(0..3600) Default: 15	Time synchronization interval in seconds. If value is 0, no time synchronization will be done.
Enable Time Synchronization Client	True False Default: False	Controls if time synchronization client is initially in use or not.
SNTP Server		
Enable Time Synchronization Server	True False Default: False	Controls if time synchronization server is initially in use or not.
Port Number For Time Synchronization Server	(1...65535) Default: 123	Port number for time synchronization server

3.4. Building object tree

3.4.1. General about building object tree

The object tree is built in the Communication structure of SAB600, see Figure 3.2-1. It is built by adding objects in a logical order starting from the Gateway.

You have several possible ways to add objects to the object tree in the Communication structure:

- You can right-click the object to which you want to add a child object. Then select **New > Object type group > Object name**, for example **New > Time Synchronization > SNTP OPC Server**.
- You can right-click the object type and select **New > New**. A New Object window appears. Select the object type you want to add and click **OK** or double-click it.
- You can copy the object.

Add the objects in the following order:

1. Gateway
2. SNTP OPC Server
3. SNTP Virtual Subnetwork (optional)
4. SNTP Virtual IED (optional)
5. Logical Device objects (optional)
6. Logical Node objects (optional)
7. Data objects (optional)



Virtual Subnetwork and objects below it are only needed for diagnostic purpose.

3.4.2. Adding Gateway object

To start building the object tree, add a Gateway object in the Communication structure by selecting the project name, right-click it and select **New > Communication > Gateway**.

3.4.3. Adding SNTP OPC Server object

After the Gateway object has successfully been added, you can continue building the object tree by adding an SNTP OPC Server object.

To add an SNTP OPC Server object:

1. Select the Gateway object in the communication structure and right-click it.
2. Select **New > Time Synchronization > SNTP OPC Server**.

By using the SCL Import function, it is possible to import an entire server's or individual device's configurations without having to insert them manually. To open the SCL Import function, right-click the desired object, and select **SCL Import**.

For more information about the SCL Import function, see COM600 User's Manual.

3.4.4. Adding SNTP Virtual Subnetwork objects (optional)



Virtual Subnetwork and the objects below it are only used to provide diagnostic status information about the SNTP server or client for the COM600 HMI or other applications.

After the server object has been successfully added, you can continue building the object tree by adding subnetwork objects.

To add SNTP Virtual subnetwork object:

1. Select SNTP OPC Server object.
2. Right-click the SNTP OPC Server object.
3. Select **New > New** or **New > Virtual > SNTP Virtual Subnetwork**.

3.4.5. Adding Virtual IED objects (optional)

After adding a subnetwork you can add virtual device objects.

To add a Virtual Device object:

1. Select a Subnetwork object.
2. Right-click on the Subnetwork object and select **New > New** or **New > Virtual > SNTP Virtual IED**.

With SCL import function, you can import new objects with configurations from an existing file. Right-click the device and select **SCL Import** from the shortcut menu.

To import a new configuration file:

1. Click **Select File**.
2. Browse to a new configuration file from the appearing dialog.
3. Select the file and click **Open**.
4. Select the device to import from the drop-down list. You can preview the configuration on the right.
5. Click **Import**.

The new preconfigured objects appear in the object tree. If the configuration file is large, the import may take time. To import a configuration file for a different device, right-click the device, select **SCL Import** again and repeat the steps above.

For more information about the SCL Import function, see COM600 User's Manual.

3.4.6. Adding Logical Device objects (optional)

Virtual subnetwork and the objects below it are only used for diagnostic purpose. Once a Virtual IED object is added, two data objects representing **Server Status** and **Client Status** are pre-populated and included in the object tree.

To add a Logical Device object:

1. Select an SNTP Virtual IED object and right-click it.
2. Select **New > New** or **New > Communication > SNTP Virtual LD**.



Each SNTP IED must have at least one Logical Device object as a child object.

3.4.7. Adding Logical Node objects (optional)

To add a Logical Node:

1. Select a Logical Device object and right-click it.
2. Add a Logical Node object.
3. Rename the new object. The names of the Logical Node objects have to be unique.



You should have only one Logical Node 0 (LLN0) as a child object to a Logical Device object.

3.4.8. Adding data objects (optional)

To add a data object:

1. Select a Logical Node object and right-click it.
2. Add a data object.
3. Rename the new object. The names of the data objects have to be unique. However, you can have a data object with same name under a different Logical Node.

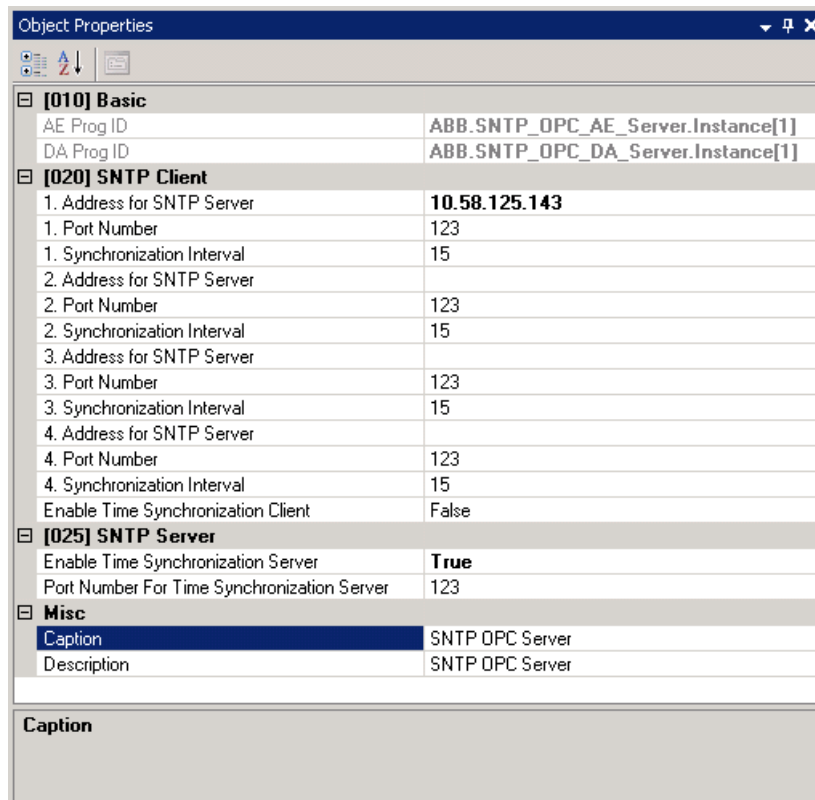
3.5. Configuring objects

3.5.1. Configuring object properties

After the objects have been added, you must configure the object properties.

To configure an object:

1. Select an object in the object tree of the Communication structure.
2. The object properties appear now in the Object Properties window, see Figure 3.5.1-1. You can see the selected object on the left and the available properties on the right.
3. Select the property you want to configure. Depending on the property value type, configuring is always done either by
 - selecting a predefined value from a drop-down combo box, or
 - entering a text string or a numerical value in a text field.



SNTP_OPC_Server_Object_Properties.PNG

Figure 3.5.1-1 Example of object properties

The available properties for different objects are listed in the following subsections.

3.5.2. Configuring SNTP OPC Server properties

Table 3.3-1 lists the configurable SNTP OPC Server properties and value ranges for them. The actual configuration by using SAB600 is performed as described in 3.5.1, Configuring object properties.

Table 3.5.2-1 SNTP OPC Server properties

Name	Value/Value range	Description
SNTP Client		
1. Address for SNTP Server		IP address or node name for SNTP Server (Primary)
1. Port Number	(1..65535) Default: 123	TCP/IP port number
1. Synchronization Interval	(0..3600) Default: 15	Time synchronization interval in seconds. If value is 0, no time synchronization will be done.

Name	Value/Value range	Description
2. Address for SNTP Server	Default: None	IP address or node name for SNTP Server.
2. Port Number	(1...65535) Default: 123	TCP/IP port number
2. Synchronization Interval	(0..3600) Default: 15	Time synchronization interval in seconds. If value is 0, no time synchronization will be done.
3. Address for SNTP Server		IP address or node name for SNTP Server.
3. Port Number	(1...65535) Default: 123	TCP/IP port number.
3. Synchronization Interval	(0..3600) Default: 15	Time synchronization interval in seconds. If value is 0, no time synchronization will be done.
4. Address for SNTP Server	Default: None	IP address or node name for SNTP Server.
4. Port Number	(1...65535) Default: 123	TCP/IP port number.
4. Synchronization Interval	(0..3600) Default: 15	Time synchronization interval in seconds. If value is 0, no time synchronization will be done.
Enable Time Synchronization Client	True False Default: False	Controls if time synchronization client is initially in use or not.
SNTP Server		
Enable Time Synchronization Server	True False Default: False	Controls if time synchronization server is initially in use or not.
Port Number For Time Synchronization Server	(1...65535) Default: 123	Port number for time synchronization server

3.5.3. Configuring data objects for Internal OPC Data

3.5.3.1. General about configuring data objects for Internal OPC Data

Internal data objects describe internal status information of an OPC server, for example whether the connection between the and the device (IED) is working or not. When internal

information of an OPC server needs to be transferred, that is information that does not originate from a device, to an OPC Client, virtual data objects must be created.

The SNTP OPC Server supports three internal data object types that provide status information:

- 3.5.3.2, Integer status (INS) for OPC internal data
- 3.5.3.3, Controllable single point (SPC) for SNTP OPC internal data
- 3.5.3.4, Single point status (SPS) for OPC internal data

3.5.3.2.

Integer status (INS) for OPC internal data

Table 3.5.3.2-1 Configurable INS (for OPC internal data) properties for OPC Servers

Property/Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	INS	Common data class according to IEC 61850
Addresses		
Item Tag Path	Default: None	Item tag path for the internal status information. The internal server tags that can be used are located in the Attributes nodes that are located under the root, line, and IED nodes. When an attribute tag is referred to in the internal item definitions below, it is possible to use either the whole tag path or just the path relative to the IED (the internal tags are configured per IED); for example, Attributes\Diagnostic counters\Transmitted data messages. When the whole path is used, it must be preceded by a slash (/) character, for example, /Channel Name\Attributes\Diagnostic counters\Transmitted data messages.

3.5.3.3.

Controllable single point (SPC) for SNTP OPC internal data

Table 3.5.3.3-1 Configurable SPC (for OPC internal data) properties for OPC Servers

Property/Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	SPC	Common data class according to IEC 61850.
Addresses		

Property/Parameter	Value or Value range/ Default	Description
Item Tag Path	Default: None	Item tag path for the internal status information. The internal server tags that can be used are located in the Attributes nodes that are located under the root, line and IED nodes. When an attribute tag is referred to in the internal item definitions below it is possible to use either the whole tag path or just the path relative to the IED (the internal tags are configured per IED) e.g. Attributes\Diagnostic counters\Transmitted data messages. When the whole path is used it must be preceded by a slash (/) character e.g. /Channel Name\Attributes\Diagnostic counters\Transmitted data messages.

3.5.3.4.

Single point status (SPS) for OPC internal data

Table 3.5.3.4-1 Configurable SPS (for OPC internal data) properties for OPC servers

Property/Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	SPS	Common data class according to IEC 61850
Addresses		
Item Tag Path	Client Status: Attributes\TimeSync\Timesync client\In use Attributes\TimeSync\Timesync client\Timesync status Server Status: Attributes\TimeSync\Timesync server\In use Attributes\TimeSync\Timesync server\Timesync status	Item tag path for the internal status information. The internal server tags that can be used are located in the Attributes nodes that are located under the root, line, and IED nodes. When an attribute tag is referred to in the internal item definitions below, it is possible to use either the whole tag path or just the path relative to the IED (the internal tags are configured per IED); e.g. Attributes\Diagnostic counters\Transmitted data messages. When the whole path is used, it must be preceded by a slash (/) character, e.g. /Channel Name\Attributes\Diagnostic counters\Transmitted data messages.

4. Operation

4.1. About this section

This section describes the basic operation procedures you can carry out after the been configured.

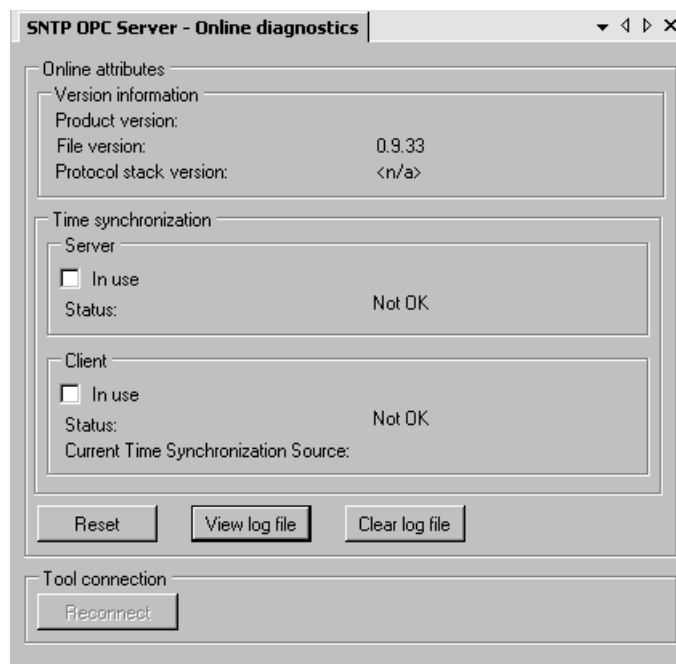
After this, you can, for example, monitor and control the condition of connections in network. This is done by using the Online diagnostics function in SAB600.

4.2. Activating COM600 with new configurations

For information about activating COM600 with new configuration, see COM600 User's Manual.

4.3. SNTP OPC Server diagnostics

To view the SNTP OPC Server diagnostics, right-click the SNTP OPC Server object and select **Diagnostic AE Client**, see Figure 4.3-1.



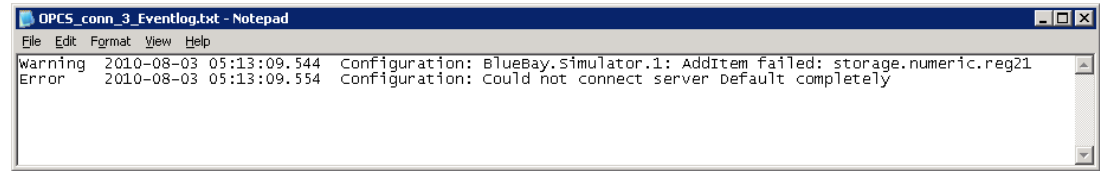
SNTP_OPC_Server_Online_Diagnostics.png

Figure 4.3-1 SNTP OPC Server diagnostics

You have the following alternatives:

- to view version information

- to reset the SNTP OPC Server
- to view the event log file
- to clear the log file



Ext_Event_log_file.png

Figure 4.3-2 Event log file

Diagnostic AE Client

Diagnostic events can be monitored and controlled using the Diagnostic AE Client function. Click **Refresh** to update the status information. To be able to receive events from a certain device, diagnostic events must be enabled for this respective device.

To enable diagnostic events:

1. Right-click the device.
2. Select **Diagnostic AE Client**.

4.4. Data object diagnostics

For information on data object diagnostics, refer to COM600 User's Manual.

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